

## Hydrologic Effects of the 17 January 1994 Northridge Earthquake

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The Northridge earthquake produced coseismic groundwater –level changes due to strain, water-level oscillations due to the passage of seismic waves, and other hydrologic effects whose mechanisms are not understood. Water levels in monitored wells 50 to 90 km east of the epicenter fell or rose 1 to 50 cm at the time of the earthquake, in directions generally consistent with the static coseismic volumetric strain field. A coseismic discharge increase of 60 liters/second (l/s) was recorded in Santa Paula Creek, 55 km WNW of the epicenter in the area subject to coseismic volumetric contraction. Discharge of the Southern Pacific spring, 163 km E of the epicenter, reportedly increased 1 l/s beginning January 4, before the earthquake, with an additional post-seismic increase of 4 l/s. In Parkfield, California, the water level in a 30-m deep well 280 km from the epicenter rose 19 cm, with a time history similar to water-level rises after four other recent California earthquakes. Measured water levels fluctuated 1.5cm in the Long Valley caldera, 380 km N of the epicenter. In Grants Pass, Oregon 1012 km NNW of the epicenter, a datalogger sampling at 1 Hz recorded seismic water-level oscillations in a 91-m deep well completed in fractured granodiorite. Maximum peak-to-peak amplitude was 22 cm at 15-20s periods, followed by 10 minutes of decaying oscillations with a dominant 10-s period. All these phenomena have also been observed for previous earthquakes, and are distinct from normal hydrologic variations.